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Petite

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(54) **MULTI-FUNCTION GENERAL PURPOSE TRANSCEIVERS AND DEVICES**

(75) Inventor: **Thomas D. Petite**, Atlanta, GA (US)

(73) Assignee: **SIPCO, LLC**, Atlanta, GA (US)

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See application file for complete search history.

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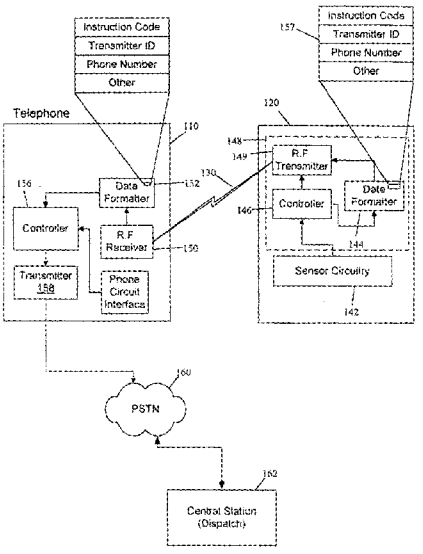
Primary Examiner — Binh Tieu

(74) *Attorney, Agent, or Firm* — Dustin B. Weeks, Esq.; Troutman Sanders LLP

(57) **ABSTRACT**

The present invention is generally directed to a system and associated method for communicating information. In some embodiments, the invention is directed to a general purpose transceiver having a receiver for receiving an information signal and a transmitter configured to transmit an outgoing signal to a central station. A portion of the information signal can include an instruction code, which may be decoded and acted upon accordingly. Other embodiments and features are also claimed and described.

17 Claims, 10 Drawing Sheets



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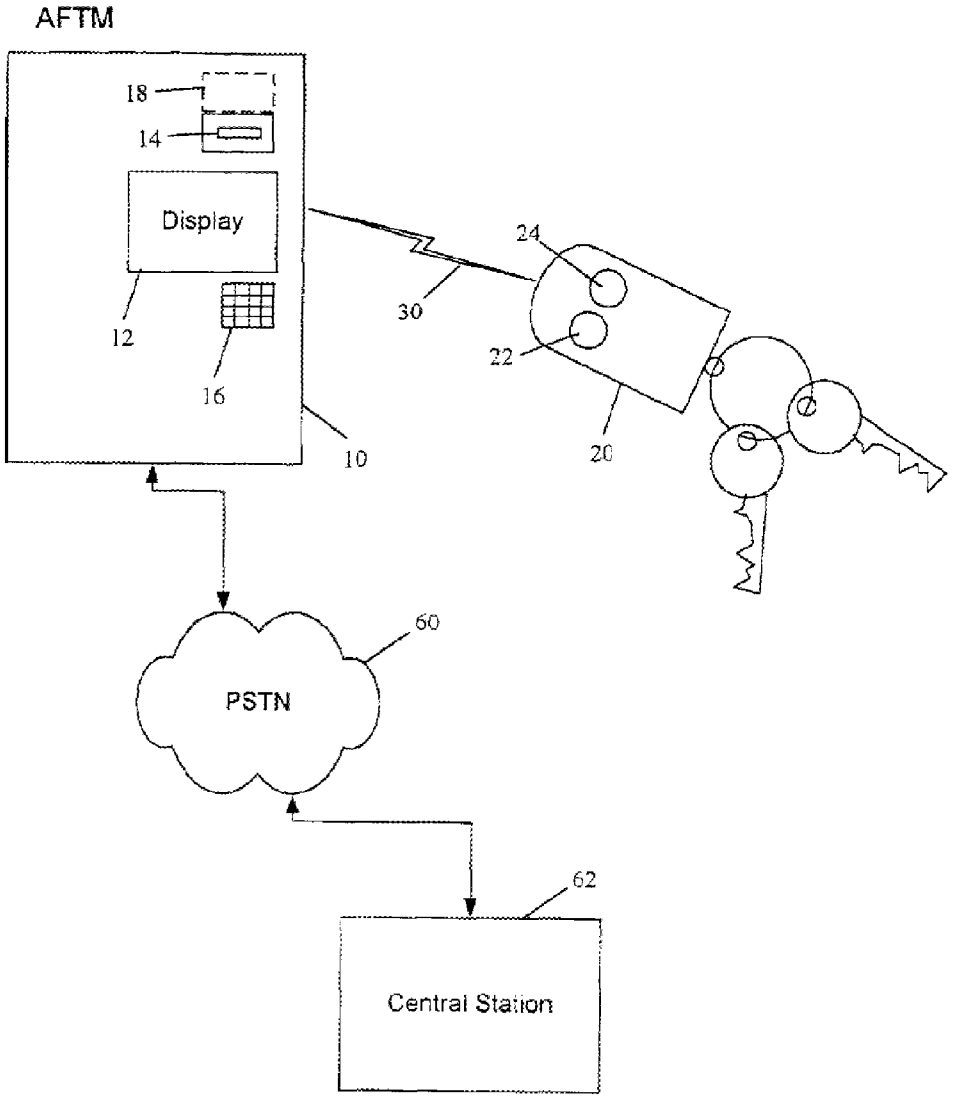
AFTM
18
14
Display
12
16
10
30
24
22
20
60
PSTN
62
Central Station

FIG. 1A

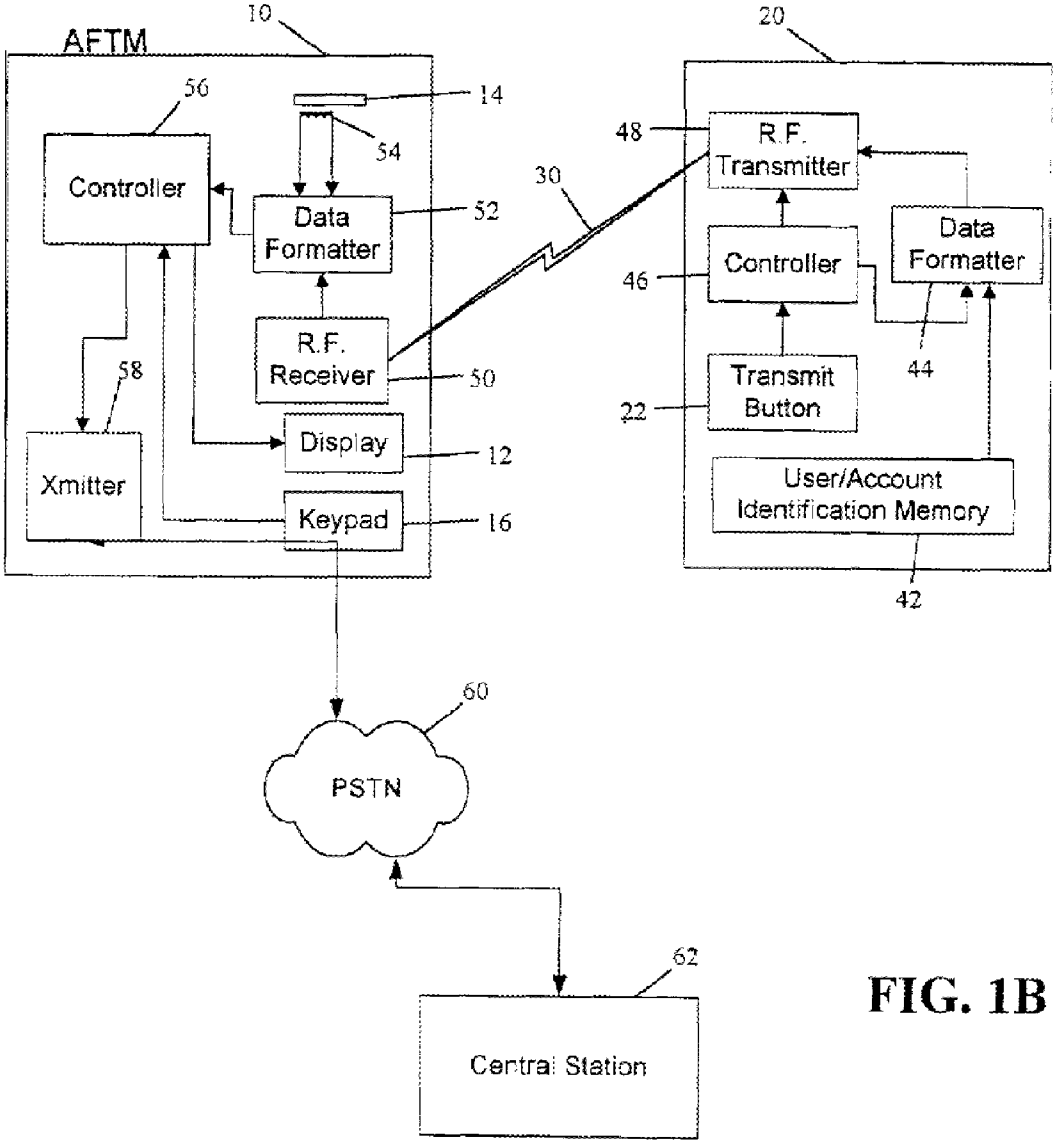
AFTM
10
20
56
14
54
Controller
Data Formatter
52
30
48
R.F. Transmitter
46
Controller
Data Formatter
44
R.F. Receiver
50
58
Transmit Button
22
Display
12
Xmitter
Keypad
16
User/Account Identification Memory
42
60
PSTN
62
Central Station

FIG. 1B

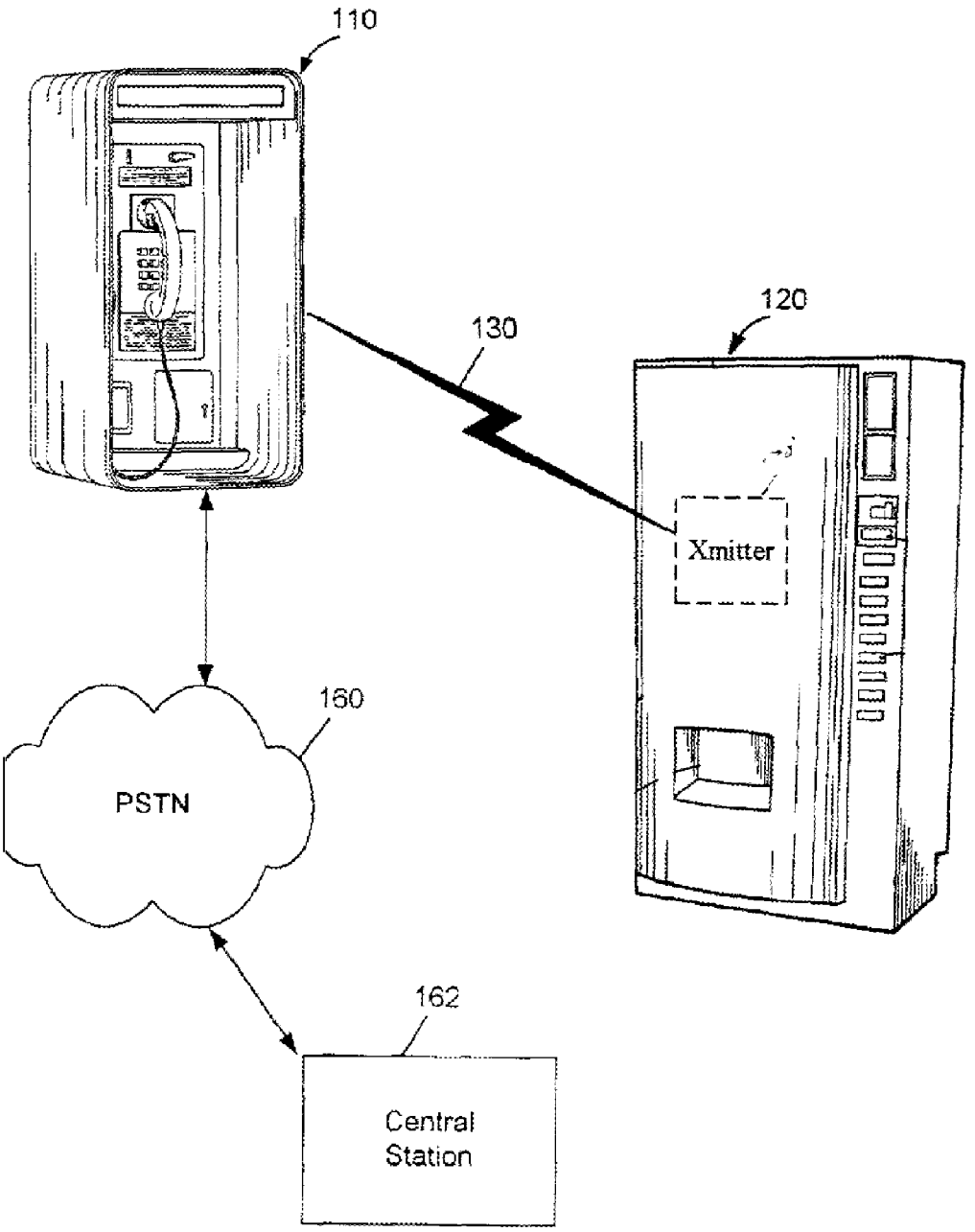

FIG. 2A

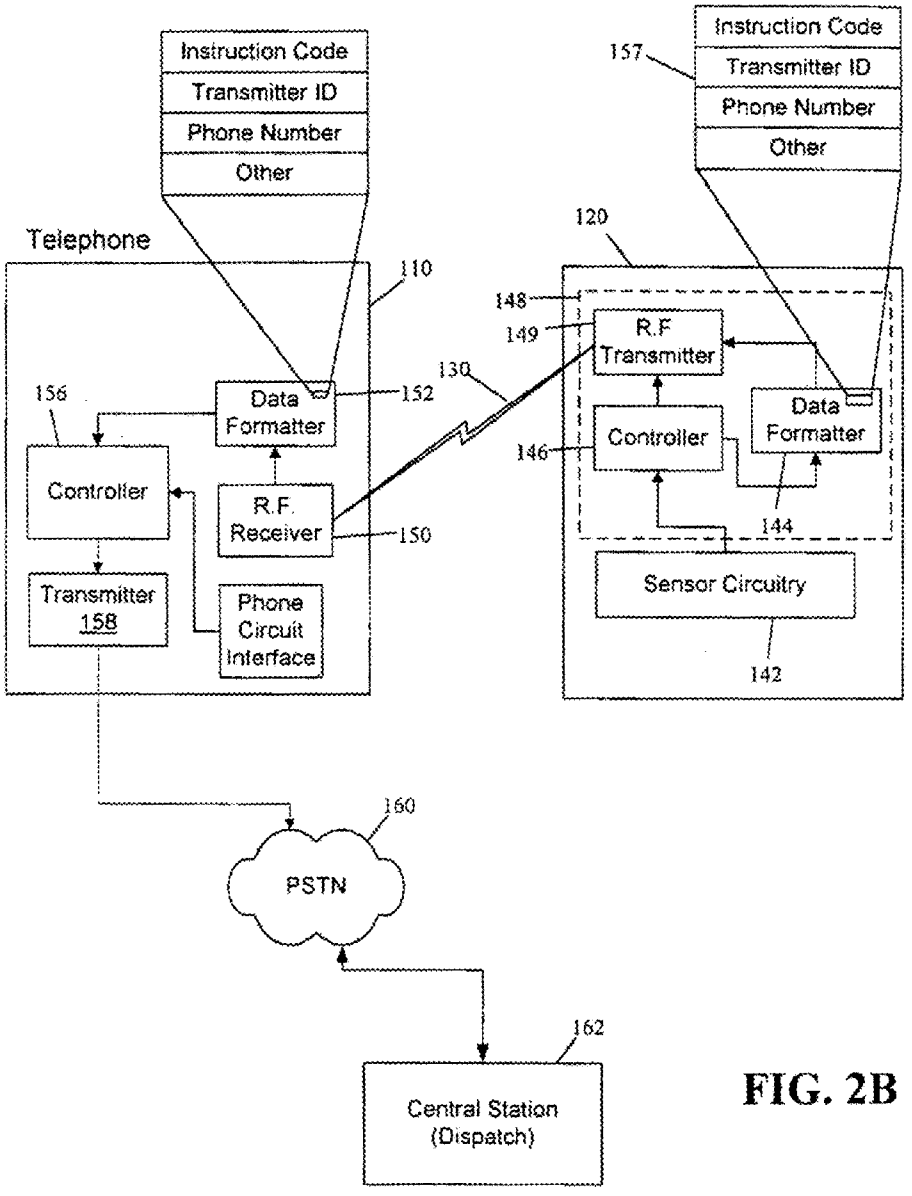
Instruction Code
Transmitter ID
Phone Number
Other
157
Instruction Code
Transmitter ID
Phone Number
Other
Telephone
110
120
148
149
R.F Transmitter
130
156
Data Formatter
152
Data Formatter
Controller
146
Controller
R.F. Receiver
150
144
Transmitter 158
Phone Circuit Interface
Sensor Circuitry
142
160
PSTN
162
Central Station (Dispatch)

FIG. 2B

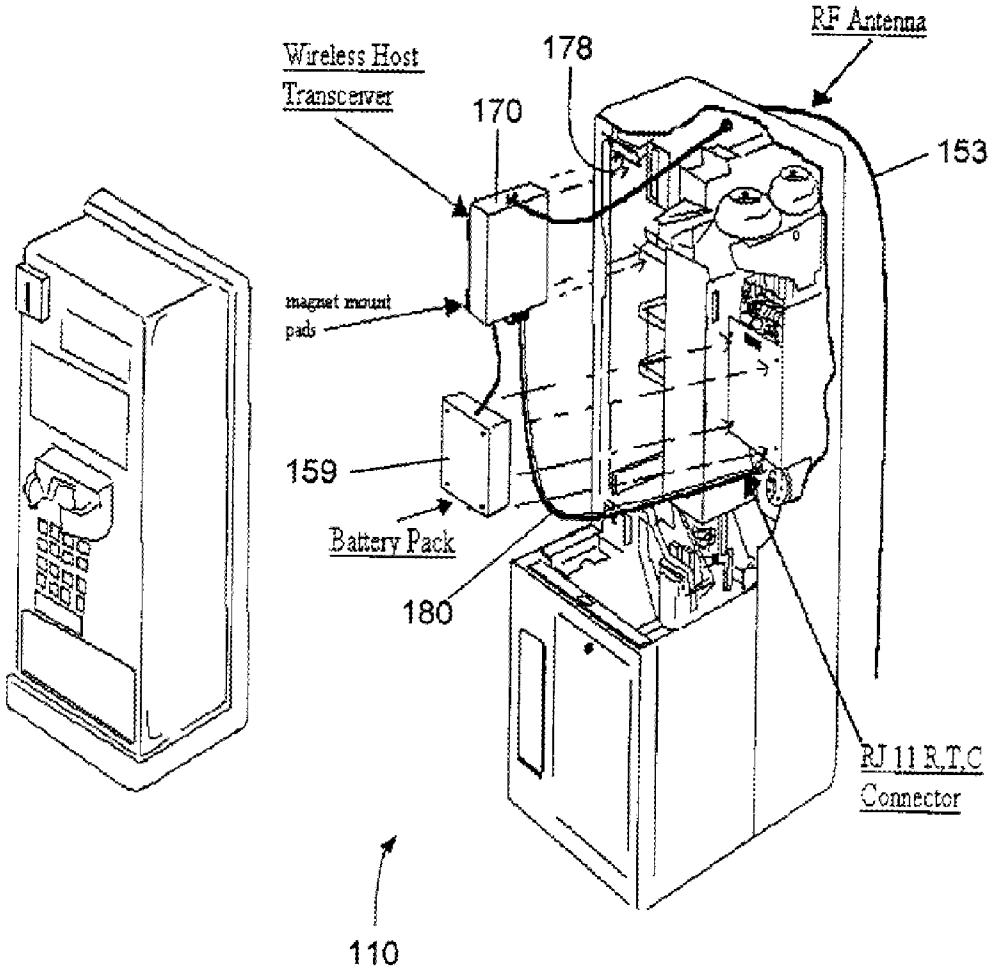
RF Antenna
Wireless Host
Transceiver
178
170
153
magnet mount
pads
159
Battery Pack
180
RJ 11 R.T.C
Connector
110

FIG. 3

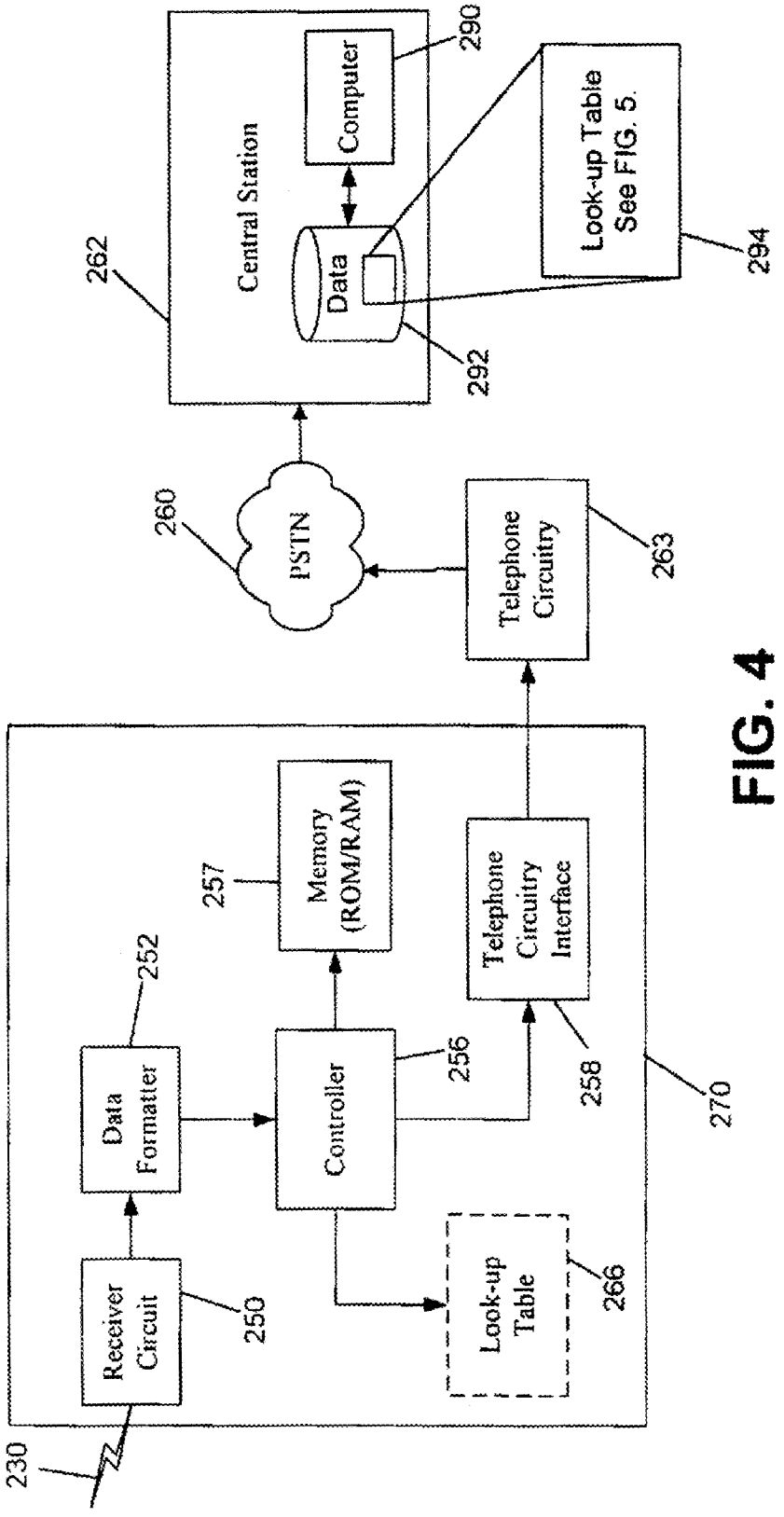
Central Station
262
Computer
290
Data
292
Look-up Table
See FIG. 5.
294
PSTN
260
Telephone Circuitry
263
Memory (ROM/RAM)
257
Telephone Circuitry Interface
258
Data Formatter
252
Controller
256
Look-up Table
266
Receiver Circuit
250
230
270

FIG. 4

Instruction Code	Function
00000001	Vending machine n is low on product X
00000002	Vending machine n is out of product X
00000003	Vending machine n is out of product Y
00000004	Vending machine n is out of order
00000005	Vending machine n is tilted
⋮	⋮
00100101	Person Y is in distress.
⋮	⋮
00111101	Trash Compactor m is in need of service.
⋮	⋮
10011001	Gas pump k is low on fuel.

294

FIG. 5

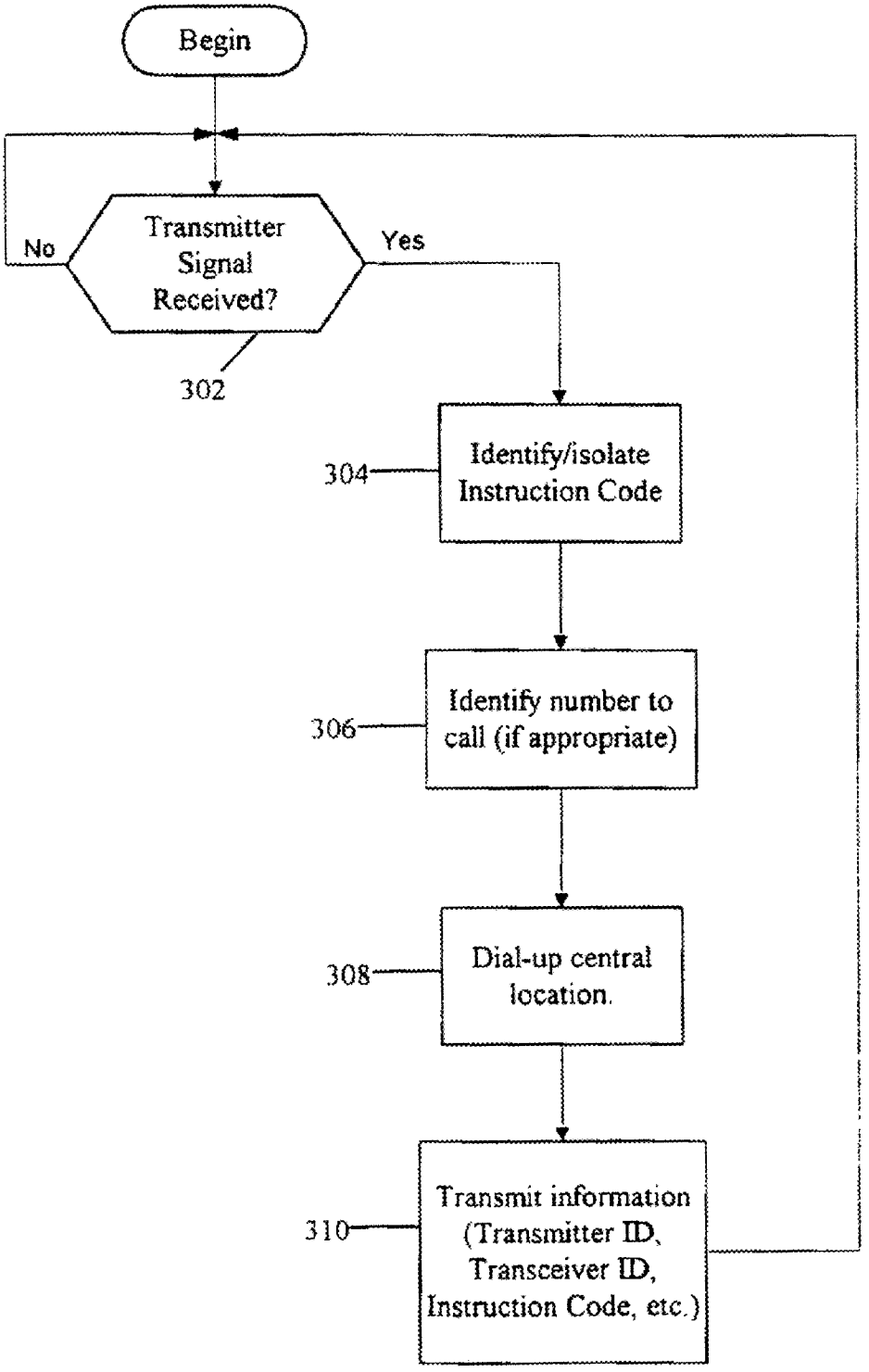
Begin
Transmitter Signal Received?
No
Yes
302
304
Identify/isolate Instruction Code
306
Identify number to call (if appropriate)
308
Dial-up central location.
310
Transmit information (Transmitter ID, Transceiver ID, Instruction Code, etc.)

FIG. 6

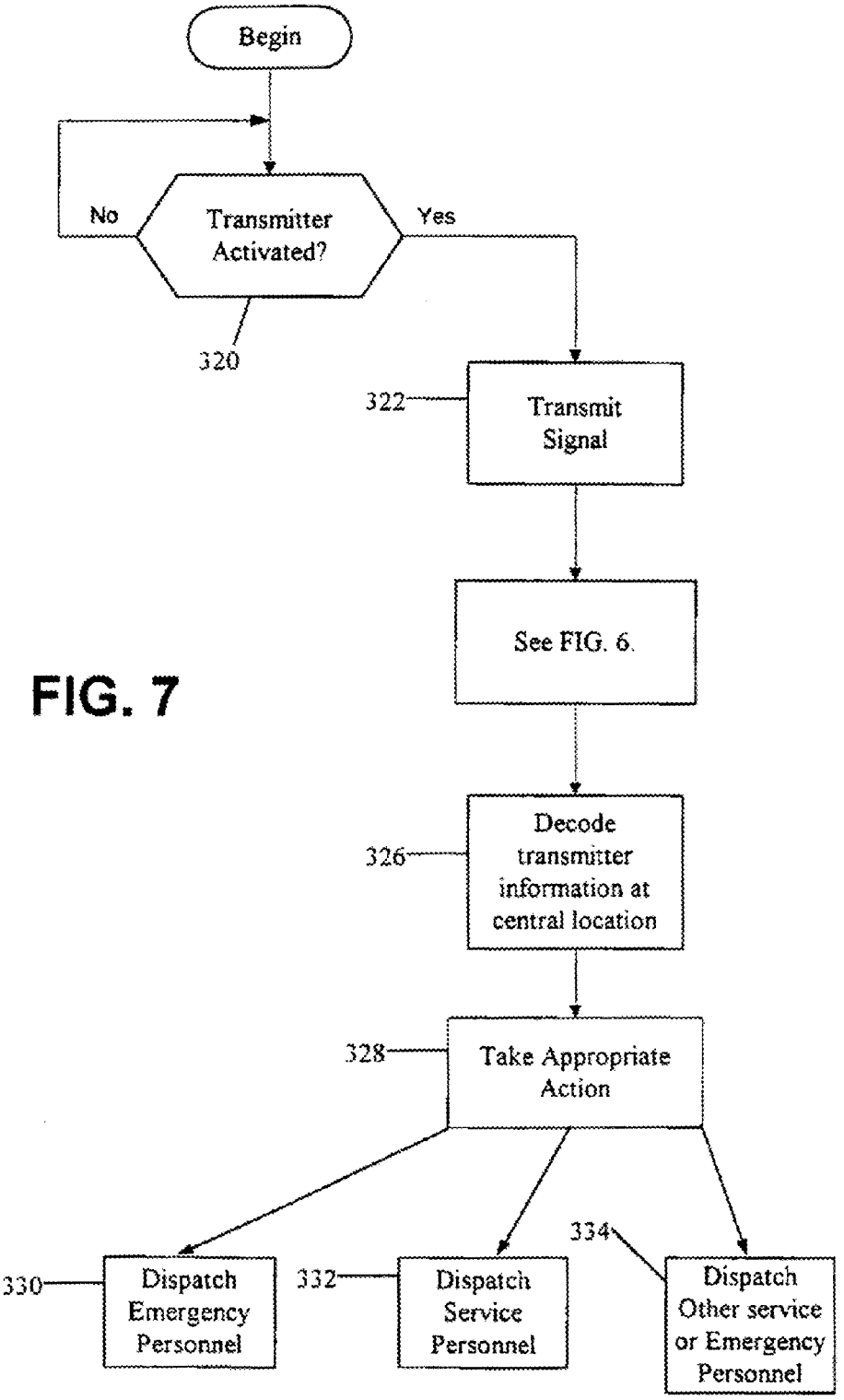
Begin
No
Transmitter Activated?
Yes
320
322
Transmit Signal
See FIG. 6.
326
Decode transmitter information at central location
328
Take Appropriate Action
330
Dispatch Emergency Personnel
332
Dispatch Service Personnel
334
Dispatch Other service or Emergency Personnel

FIG. 7

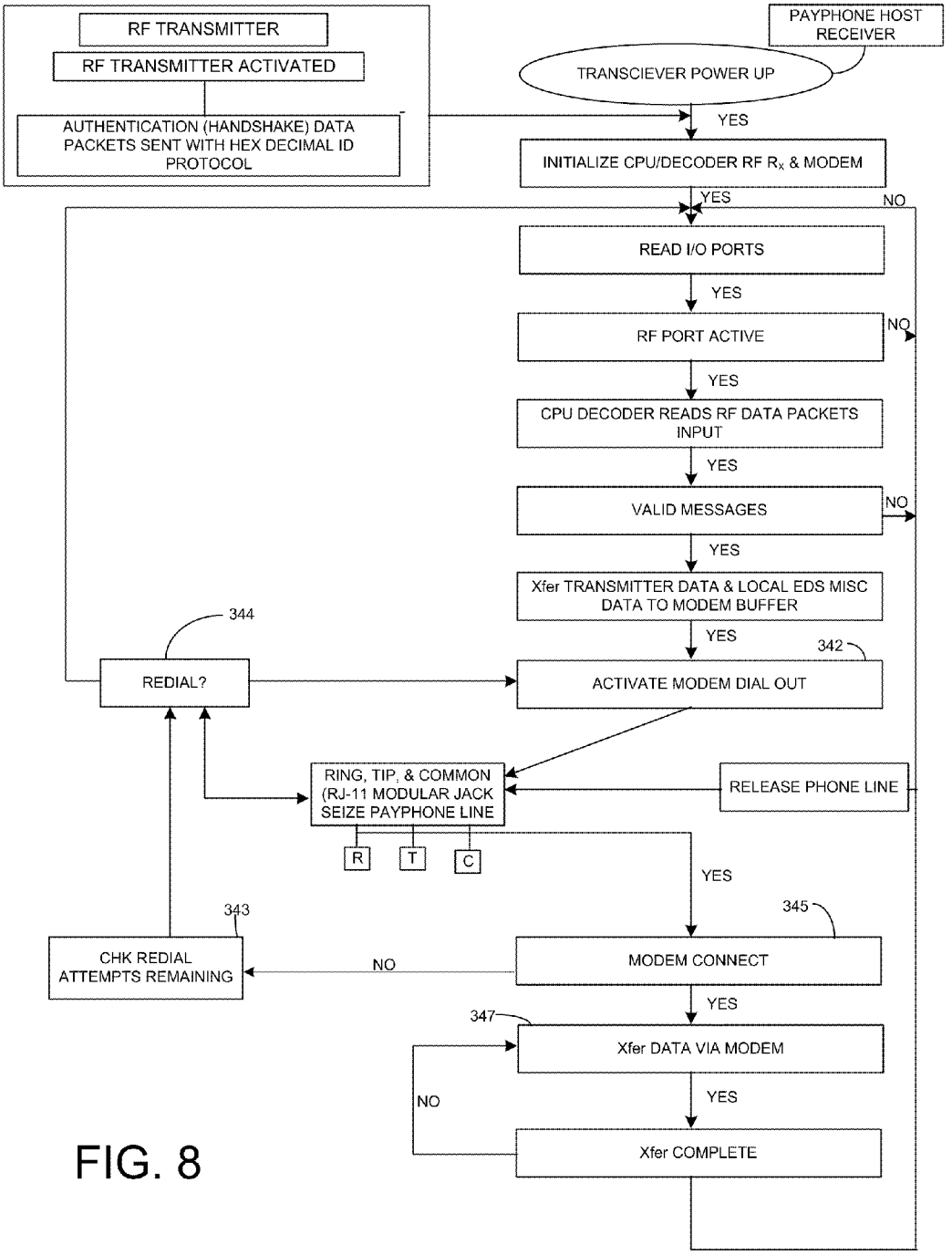
RF TRANSMITTER
RF TRANSMITTER ACTIVATED
AUTHENTICATION (HANDSHAKE) DATA PACKETS SENT WITH HEX DECIMAL ID PROTOCOL
PAYPHONE HOST RECEIVER
TRANSCIEVER POWER UP
YES
INITIALIZE CPU/DECODER RF Rx & MODEM
YES
NO
READ I/O PORTS
YES
RF PORT ACTIVE
NO
YES
CPU DECODER READS RF DATA PACKETS INPUT
YES
VALID MESSAGES
NO
YES
Xfer TRANSMITTER DATA & LOCAL EDS MISC DATA TO MODEM BUFFER
YES
342
344
REDIAL?
ACTIVATE MODEM DIAL OUT
RING, TIP, & COMMON (RJ-11 MODULAR JACK SEIZE PAYPHONE LINE
RELEASE PHONE LINE
R
T
C
YES
343
345
CHK REDIAL ATTEMPTS REMAINING
NO
MODEM CONNECT
YES
347
Xfer DATA VIA MODEM
NO
YES
Xfer COMPLETE

FIG. 8

MULTI-FUNCTION GENERAL PURPOSE TRANSCEIVERS AND DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS & PRIORITY CLAIMS

This patent application is a continuation of U.S. patent application Ser. No. 09/756,386, filed Jan. 8, 2001, now U.S. Pat. No. 7,397,907; which is a continuation of U.S. patent application Ser. No. 09/102,399, filed Jun. 22, 1998, now U.S. Pat. No. 6,233,327; U.S. patent application Ser. No. 09/102,399 is a continuation-in-part of U.S. patent application Ser. Nos.: (a) 08/825,576, filed on Mar. 31, 1997, entitled Transmitter for Accessing Automated Financial Transaction Machines, and issuing as U.S. Pat. No. 7,137,550; (b) 08/895,720, filed Jul. 17, 1997, entitled Transmitter for Accessing Pay-Type Telephones, and issuing as U.S. Pat. No. 5,926,531; and (c) 08/910,980, filed Aug. 7, 1997, entitled Transmitter for Automatically Communicating Information to a Telephone, and now abandoned; which all three of said applications (a)-(c) claimed the benefit of U.S. Provisional Patent Application Ser. No. 60/040,316, filed Feb. 14, 1997, and entitled Card Replacement Transceiver for Use With Automatic Teller Machines. U.S. patent application Ser. No. 09/102,399 further claims the benefit of U.S. Provisional Patent Application Ser. No. 60/059,643, filed Sep. 20, 1997, and entitled System For Requesting Service Of A Vending Machine. All of said above-listed applications are hereby incorporated by reference as is fully set forth herein.

TECHNICAL FIELD

The present invention generally relates to transceivers, and more particularly to a general purpose radio frequency (RF) transceiver having an open-ended architecture that readily adapts it for a wide variety of uses and applications.

BACKGROUND

There are a wide variety of circumstances in which it is desired or desirable to communicate information to a single location. For example, in the banking industry, when a user accesses an automated teller machine (ATM), it may be desirable to communicate the user identifying information (e.g., account and PIN number) to a central location to verify that the PIN number matches the account number. Likewise, if the ATM breaks down, malfunctions, runs out of money, takes in a predetermined amount of money, or for a variety of other reasons, it may be desirable to communicate such information to a centralize location that can respond accordingly (e.g., dispatch a person to repair or otherwise service machine).

In the vending machine industry, it may be desirable to communicate information relating to the product status (e.g., low or out of stock) of a given vending machine to a central location, so that service personnel may be dispatched to replenish the product. In similar fashion, it may be desirable to communicate machine operational status to a centralized location for purposes of dispatching repair or service personnel. Thus, for example, if the vending machine malfunctions, runs out of change, acquires too much currency, or for other reasons, it may be desired to communicate this information to a centralized location

One way this type of information has been communicated in the past has been to dispatch personnel to periodically check on such machinery If problems were noted, then the dispatched personnel communicated this information to a central dispatch or service location One shortcoming with this approach, however, is that it is relatively expensive to employ an individual to make these periodic status checks Also, a machine may be disabled or otherwise in need of service for a undesirably lengthy period of time between service checks, before the service condition is noted and reported. Accordingly, it is desired to provide an apparatus that effectively addresses these and other shortcomings of the prior art.

BRIEF SUMMARY

Certain objects, advantages and novel features of the invention will be set forth in part in the description that follows and in part will become apparent to those skilled in the art upon examination of the following or may be learned with the practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

To achieve the advantages and novel features, the present invention is generally directed to a system for communicating information to a predetermined location. In accordance with one aspect of the invention, the system includes a transmitter disposed at a first location and configured to transmit a signal containing an instruction code to a transceiver The instruction code uniquely identifies an instruction to be carried out Preferably, the transmitter transmits a relatively low-power radio-frequency electromagnetic signal. The system further includes a transceiver disposed remotely from the transmitter (but within range of the transmitted signal) and is configured to receive the transmitted signal. The transceiver circuit includes a line interface circuit configured to interface with a telephone line that is part of the public-switched telephone network (PSTN) and initiate a phone call over the telephone line. In this regard, the transceiver further includes a controller configured to control both the reception of the transmitted signal and to control the communication of information over the telephone line. Finally, the system includes a central station remotely located from said transceiver but being in communication with said transceiver via the PSTN. The central station further includes a decoder configured to decode the instruction code.

As will be appreciated, the system summarized above provides an extremely robust and flexible platform for providing general purpose communications to a central location. In this regard, the term "general purpose" may also be referred to as an "open ended" platform that may be readily adapted for a wide variety of uses. The instruction code is a relatively small data value that may be decoded to define a wide variety of functions. For example, an instruction code a single byte (eight bits) in size may define up to two hundred fifty six different functions or instructions Similarly, an instruction code two bytes in size may define over sixty-five thousand (2^{16}) functions or instructions.

In operation, the transmitter transmits the instruction code, perhaps along with other information, to a transceiver located remotely, but generally nearby. The transceiver, which will preferably be integrated into a pay-type public telephone (but which can be integrated into virtually any telephone or other device having access to the PSTN), receives the transmitted information including the instruction code, and communicates this information to a predetermined location over the PSTN. In this regard, the transceiver is configured with a controller or other appropriate component to place a call to a predetermined phone number. Once the connection is established, the instruction code may be communicated (as by modem) to the predetermined location. The predetermined

location (which may be a central dispatch location) then decodes the instruction code to identify the function or instruction that corresponds to the code, and further initiates an appropriate response.

To illustrate the foregoing summary with a more concrete example, consider a vending machine that is running low on a particular product. A sensor within the vending machine may make this determination and signal the transmitter accordingly. The transmitter then broadcasts a transmission that includes an instruction code that corresponds to the low product alert. The transceiver receives the broadcast transmission and communicates this information to a predetermined phone number. In this respect, the predetermined phone number may also be communicated from the transmitter to the transceiver along with the instruction code. Assuming that the predetermined number corresponds to a central dispatch center, the center answers the phone call placed by the transceiver and receives the instruction code. It then decodes the instruction code to determine that a particular product is low in the vending machine, and it may dispatch an appropriate service person to restock the machine. To this end, the center may be configured to generate an email message to route to an appropriate service person to handle the request.

In accordance with another aspect of the invention, a method is provided for performing an automated service request. In accordance with this aspect of the invention, the method includes the steps of sensing a service condition and notifying a transmitter of the service condition. Then the method transmits an information signal from the transmitter to a remotely-located transceiver, wherein the information signal includes a function code that specifies the service condition. Thereafter, the method places a call from the transceiver to a central station over a phone line comprising a part of the public switched telephone network (PSTN), and communicates at least the function code from the transceiver to the central station. Finally, the method decodes the function code at the central station to identify the service request.

In accordance with a broader aspect of the present invention a multi-function, general purpose transceiver is provided In accordance with this broad aspect of the invention, the transceiver includes a receiver circuit for receiving a signal transmitted from a remotely located transmitter. The transceiver also includes a transmitter that is configured to communicate information over a phone line, comprising a portion of the PSTN Finally, the transceiver includes a controller that is configured acquire information from the receiver circuit, initiate a phone call to a predetermined location, and transmit the acquired information over the PSTN to the called location

BRIEF DESCRIPTION OF FIGURES

The accompanying drawings incorporated in and forming a part of the specification, illustrate several aspects of the present invention, and together with the description serve to explain the principles of the invention. In the drawings:

FIGS. **1**A and **1**B are block diagrams of a system constructed in accordance with one embodiment of the invention;

FIGS. **2**A and **2**B are block diagrams of a system constructed in accordance with an alternative embodiment of the invention;

FIG. **3** is an exploded perspective view of a telephone housing a transceiver constructed in accordance with the invention;

FIG. **4** is a block diagram illustrating a transceiver constructed in accordance with one embodiment of the invention;

FIG. **5** is look-up table illustrating the association of instruction codes with there relevant function;

FIG. **6** is a flowchart illustrating the top-level functional operation of a transceiver constructed in accordance with one embodiment of the present invention;

FIG. **7** is a flowchart illustrating the top-level functional operation of a system constructed in accordance with one embodiment of the present invention; and

FIG. **8** is a flowchart illustrating a more detailed operation of system constructed in accordance with the present invention.

DETAILED DESCRIPTION OF PREFERRED & ALTERNATIVE EMBODIMENTS

Having summarized various aspects of the present invention, reference will now be made in detail to the description of the invention as illustrated in the drawings. While the invention will be described in connection with these drawings, there is no intent to limit it to the embodiment or embodiments disclosed therein. On the contrary, the intent is to cover all alternatives, modifications and equivalents included within the spirit and scope of the invention as defined by the appended claims.

While the present invention is broadly directed to a general purpose transceiver and a method for communicating information from remote sites to a central location, before specifically describing these aspects of the invention, reference will first be made to two different illustrative environments and uses of the present invention In this regard, FIGS. **1**A and **1**B illustrate an environment in which information may be communicated from financial transaction machines (e.g., ATMs) to a central location, and FIGS. **2**A and **2**B illustrate an environment in which information may be communicated from vending machines to a central location However, it will be appreciated by persons of skill in the art from a reading of this disclosure that the present invention may have a wide variety of other uses, and a transceiver constructed in accordance with the invention may be utilized in a wide variety of environments.

Turning now to the drawings, FIG. **1** shows a system level block diagram of an automatic financial transaction. More specifically, the figure shows an automatic financial transaction machine (AFTM) **10** being remotely accessed by a transmitter **20**. The AFTM **10** may be any of a number of devices, including, most commonly, an automated teller machine for banking. However, the AFTM **10** may further encompass devices such as gas pumps of the type equipped to receive credit cards for charging an otherwise cash transaction. It will be appreciated that other similar devices fall within the scope of the term.

In the embodiment illustrated in FIG. **1**A, the AFTM **10** includes a display **12**, such as a CRT, for providing a visual display to a user. A card receiving slot **14** is also shown. As is known, the card receiving slot **14** receives a plastic card such as a bank card, credit card, or some other magnetically encoded card for purposes of user identification. A key pad **16** for inputting information, such as a personal identification number (PIN), transaction amounts, and other information is also illustrated in the drawing.

Finally, the last functional block illustrated in the AFTM **10** of FIG. **1**A is receiving unit **18** The receiving unit **18** has been illustrated in dashed lines, since it will typically reside inside the AFTM **10** The receiving unit **18** is adapted to receive a signal transmitted from a remote transmitter **20**, interpreting that signal in order to allow a user access to the AFTM **10**. Preferably, the receiving block **18** comprises a radio fre-

quency (RF) receiving for receiver electromagnetic waves transmitted from an RF transmitter contained with the remote transmitter unit **20**. However, consistent with the concepts and teachings in the present invention, the receiving block **18** may be configured to receive other wavelength electromagnetic signals, including ultrasonic or infrared.

A remote transmitting unit **20** is provided for remote communications with the AFTM **10** While the transmitter **20** will be described in more detail below, it broadly operates to transmit an electromagnetic signal **30** to a receiver located at the AFTM **10**, wherein said electromagnetic signal is encoded with user identifying information to allow a user to gain access to the AFTM **10**. In this regard, an internal transmission circuit (not shown) is provided within the transmitter **20** to act upon command to transmit the encoded electromagnetic signal **30**. A transmit button **22** is provided for the user. As illustrated, the transmitter **20** is quite small and may be conveniently attached, for example, to a key ring for ready and portable use. Indeed, in one embodiment, the single transmitter constructed in accordance with the present invention may serve multiple functions For example, small transmitters of this type are known for activating and deactivating automobile alarm systems. The transmitter of the present invention may be integrally designed with such an automobile remote to provide the dual functionality of remotely controlling an automobile alarm along with the functionality of remote access to an AFTM **10**. In accordance with such an embodiment, a second transmit button **24** would be provided. In this regard, the first transmit button **22** would be operative to, for example, operate the AFTM **10**, while the second transmit button **24** would be operative to remotely operate the automobile alarm. It will be appreciated that the frequency, and/or format of the transmit signal **30** transmitted will be different for the different applications. For example, the signal transmitted to AFTM **10** may include account identification information, while only a unique activation sequence need be transmitted to actuate an automobile alarm.

In yet a further embodiment, additional transmit buttons (not shown) may be provided as well. To illustrate, presently people typically carry multiple banking and/or credit cards in their billfolds or purses. In accordance with one embodiment, a transmitting unit **20** may be provided with multiple transmit buttons, wherein a transmit button **22**, **24** is uniquely assigned to a different banking and/or credit card Therefore, if a user has a bank checking account, and credit accounts with other financial institutions for both VISA and MASTERCARD credit cards, then three distinct transmit buttons would be provided for accessing the three different accounts. It should be appreciated that many AFTM's **10** presently allow access to a wide number and variety of accounts, including MASTERCARD, VISA, AMERICAN EXPRESS, etc. Such a machine would be constructed in accordance with the invention to recognize the transmissions from each of the different transmit buttons depressed. In accordance with the description provided below, the various user/account information will be different for each account, and therefore, the signal transmitted will be different. Providing a separate transmit button for each of these functions/account simplifies the user interface. A simpler way to envision such a transmitter **20** is to recognize that each individual credit/banking card that a user may carry in a billfold or purse would be replaced by an additional transmit button on the transmitter **20**.

In use, a user would simply depress a transmit button **22**, which would result in the transmitter **20** transmitting an electromagnetic signal **30** to a remote AFTM **10** Preferably, the transmitter **20** is an extremely low power transmitter, so that a user will have to be in close proximity, (e.g., several feet) to the receiver **18** of an AFTM **10** in order to use the transmitter. This would help alleviate problems which may otherwise occur if a user approaching an AFTM **10** is circumvented by a second, more distantly located user who depresses his transmit button. This extremely low-power operation also helps to prevent the unlawful interception of the electromagnetic signals In addition, in an alternative embodiment, the transmitted signal may be encrypted for further protect against such unlawful interception

A receiving unit **18** disposed within the AFTM **10** receives and decodes the signal **30** The AFTM **10** then evaluates the received, decoded signal to ensure that it identifies a legitimate user/account If so, the user may then access the AFTM **10** In the case of an automatic teller machine, or other similar AFTM **10**, a user may then be prompted to enter a personal identification number (PIN) into, for example, key pad **16**, as an added measure of security. However, in many AFTM's, a user will not need to make any further input. For example, many gas pumps are presently automated to receive an inserted credit card and debit the corresponding account according to the amount of gasoline purchased. Presently, there is no need in these devices for a user to manually key in a personal identification number. In similar fashion, the system may be configured to operate automatically and exclusively by the depression of a transmit button on the transmitter **20**.

Having now presented an overview of the basic operation of the system of FIG. **1**A, reference is made to FIG. **1**B which shows a more detailed block diagram of the components contained within the AFTM **10** and remote transmitting unit **20** As previously mentioned, the transmitting unit **20** includes a transmit button **22**, which initiates the data transmission. The other primary functional blocks of the transmitter **20** include a memory **42**, a data formatter **44**, a controller **46**, and an RF transmitter **48**. It will be appreciated that the functional blocks shown in FIG. **1**B are shown for purposes of illustration and facilitating a better understanding of the broad concepts of the system. The functional blocks of the illustrated embodiment should not, however, be viewed as specific limitations on the invention. For example, data formatter **44** and controller **46** (discussed below) may be embodied in a single functional unit. Indeed, it is contemplated that the entirety of the circuitry of the transmitter **20** will be contained within a single integrated circuit component

In keeping with the description of the transmitter **20**, the controller **46** lies at the heart of the transmitter **20**, and serves to control the overall functionality thereof. In this regard, the controller **46** is responsive to the depression or actuation of transmit button **22** to begin the data transaction and signal transfer. More particularly, when a user depresses the transmit button **22**, the controller **46** initiates the data transmission sequence by accessing an internal memory **42**, which, among other things, stores user and/or account identification information. This information is then passed to a data formatter functional block **44** which places the data in an appropriate and predefined format for transmission to the AFTM **10**. It is contemplated that the above-described functionality occurs in electronic format. This electronic data is then sent from data formatter **44** to an RF transmitter **48** for conversion from electric to electromagnetic form. As is well known by those skilled in the art, a variety of transducers can perform this functionality adequately.

The AFTM **10** receives the transmitted electromagnetic signal **30** at an RF receiver **50** This receiver serves to convert the data from electromagnetic format into electrical format (e.g., a digital signal) and passes that data to a data formatter **52**. Also illustrated as comprising principal functional com-

ponents of the AFTM **10** are the magnetic card receiving slot **14**, a transducer or magnetic pick-up **54**, the display **12**, the keyboard **16**, a block denoted as controller **56**, a cloud denoted as miscellaneous **58**, and a communication network (e.g., the PSTN) **60**

In a manner that is well known, a magnetically encoded card is inserted into slot **14**, wherein the information encoded on the card's magnetic strip is read by transducer or magnetic pick-up **54**. The electric signals from this pick-up **54** are then formatted into a suitable, preferably digital, form by data formatter **52**. For purposes of simplifying the description, the data formatter **52** (shown as a single block) receives signals from both the transducer **54** and the RF receiver **50**. It will, however, be appreciated that the data formatting function of block **52** may be provided by two separate and distinct formatting units. In such a retrofit system, the functionality of such data formatter **52** would indeed be performed by distinct physical units.

In keeping with the description of the AFTM **10**, the information received and formatted by the data formatter **52** is then transmitted to a block denoted as Controller **56** This functional block serves to verify that the information received, either from the encoded card inserted into slot **14**, or the signal received by the RF receiver **50** is valid To do this, the AFTM **10** will generally access a centralized database (not shown) via the PSTN **60** It will be appreciated that this account verification functionality is well known in the prior art, and therefore, need not be discussed herein. Finally, a block **58** denoted as "transmitter" is illustrated within the AFTM **10**, which controls the communication of data across the PSTN **60**

As will be appreciated by those skilled in the art, the controller **56** performs a variety of functional features which depend, in part, upon the specifics of the machine **10** For example, the block will manage user input and output to and from the display **12** and keypad **16**, as well as the PSTN **60** management and access. It would further serve to access any database of information that is stored locally at the AFTM **10**.

As illustrated, the ATFM **10** communicates across the PTSN **60** to a central station **62** The central station **62** may comprise a database of financial and/or account information, which database may be utilized to verify user information. It may also include facilities that are capable of dispatching service personnel, if the ATFM **10** sends a message indicating that the machine, or its surrounding environment is in need of service. In this regard, the surrounding environment may refer lighting. As is known, a certain amount of lighting is generally desired (if not required) in the immediate vicinity of an ATM A lighting failure may be an event that is sensed and transmitted by the transceiver to report a service condition for repair. For purposes of the present invention, the actual structure and/or of the central station **62** is unimportant, and thus will not be discussed in detail herein. Suffice it to say that the central station **62** may vary from implementation to implementation.

The controller **56**, receiver **50**, data formatter **52**, and transmitter **58** may all be provided on an open-ended transceiver constructed in accordance with the present invention.

Reference is now made to FIGS. **2**A and **2**B, which illustrate another environment of the present invention. Specifically, the environment illustrated in these figures is one which provides for the automated service of a vending machine **120**. In this regard, a vending machine **120**, such as a soda dispensing machine, includes an internal transmitter **148** that communicates information to a nearby transceiver (not shown in FIG. **2**A, but illustrated in FIG. **4**). In accordance with this illustrated embodiment, the transceiver is incorporated into a public, pay-type telephone **110**. However, and as will be appreciated, the transceiver may be incorporated into a variety of devices, so long as it has access to a phone line, preferably one forming a part of the PSTN.

Internally, the transceiver includes receiver circuitry for receiving the transmitted signal **130** and a transmitter for communicating data via the PSTN **160** to a central station **162** In this regard, the central station **162** may be a central dispatch location, that is set up to dispatch service personnel to attend to the vending machine **120**. As will be appreciated, the vending machine **120** may encompass a wide variety of devices, in addition to a soda dispensing machine For example, the vending machine **120** may include a snack dispensing apparatus, a candy dispensing apparatus, a cigarette dispensing apparatus, a newspaper dispensing apparatus, an ice dispensing apparatus, among a laundry list of other devices.

A variety of sensors (not shown) may be provided in the vending machine **120** for detecting a variety of events. For example, detecting whether the machine is low on a given product, or out of a product, determining whether the machine is out of change; determining if the machine has taken in a predetermined amount of money, which should be emptied; detecting if the machine is out of order; etc. These, and other events sensed within the vending machine **120** may be communicated to the transmitter **148**, which then formats the data in a way that it may be readily understood by the transceiver. The transmitter **148** then transmits the data (via RF link **130**) to the transceiver disposed within the telephone **110**. This information, in turn, is communicated from the transceiver via PSTN **160** to a central station **162**. Based upon the information received, the central station **162** will institute an appropriate response. For example, if the information received is a notification that one or more of the products in the vending machine **120** is either low or out, then a first person may be dispatched to restock the machine If, on the other hand, the information received is a notification that the machine is out of order, then a second person (service person) may be dispatched to service the machine.

Having broadly described the vending machine service environment, reference is now made to FIG. **2**B, which illustrates the circuitry within the vending machine **120**, as well as the circuitry within the telephone **110**, for carrying out the inventive aspects. In this regard, the various sensors disposed within the vending machine are broadly denoted by the block labeled "Sensor Circuitry" **142**. The outputs of the various sensors may be directed to a controller **146**, which may comprise dedicated circuitry. or may alternatively comprise general purpose programmable hardware, such as a microprocessor or microcontroller. The controller **146**, in essence, handles the processing of most of the functional operations carried out at the vending machine **120**.

In this regard, and as will be discussed in more detail below, the transceiver of the present invention is characterized by an open-ended architecture that is configured to receive an encoded instruction. This encoded instruction may be decoded to identify specific and unique functions and/or instructions. For example, one code may uniquely describe the event of the vending machine **120** running out of a certain product. Although this code may be meaningless to the transceiver, when decoded by the central station **162**, an appropriate action may be taken. Thus, a vending machine company may utilize a given code to define a certain event relevant to the vending machine, while a banking enterprise may utilize the same code to define a completely different event. Nevertheless, the same general purpose transceiver may be used to implement both embodiments.

In keeping with a description of the vending machine **120**, the controller **146** is preferably configured to receive sensor outputs and compose the appropriate instruction code for transmission to the transceiver. A block called "Data Formatter" **144** may also be provided within the vending machine **120**. As the name implies, this block formats the data for transmission to the transceiver It will be appreciated that, in addition to the instruction code, other information may also be supplied by the transmitter **148**. As illustrated by the block **157** (exploded from the Data Formatter block **144**), information such as a transmitter identification code, and a destination phone number may also be included in the information transmitted to the transceiver. In this regard, the transmitter identification code uniquely identifies the transmitter, which code may be decoded at the central station to identify the specific vending machine that is originating the message. That is, the instruction code may inform the central station **162** as to the particular service need of the vending machine **120**, and the transmitter identification code may inform the central station **162** of the particular vending machine **120**, and thus its location, in need of service.

Finally, the data formatter may also include the phone number of the central station **162**; namely, phone number that the transceiver is to dial over the PSTN **160**. In this way, a generic (open-ended) transceiver may be utilized and installed in mass within public, pay-type telephones, by the service provider. Thus, various companies may then utilize specially configured transmitters **148** to communicate with the general purpose transceiver to communicate a wide variety of information to central locations, defined by the transmitters.

FIGS. **1**A, **1**B, **2**A, and **2**B illustrate two different environments in which the present invention may operate, it will be appreciated that a variety of other environments may use or implement the invention as well

Reference is now made briefly to FIG. **3**, which is an exploded perspective view of a telephone **110** incorporating a transceiver **150** constructed in accordance with the present invention In this regard, the transceiver **150** may be provided in a single module having an associated battery pack **151**. Alternatively, the transceiver **150** could be designed to operate from the power supplied to the telephone. As illustrated, the module **150** may be configured to snap into a space provided in the telephone, and maintained by a pair or resilient fingers **178**.

An external wire **153** may be provided to act as an antenna for the RF receiver. Alternatively, a smaller internal antenna may be provided. As will be appreciated by one of ordinary skill in the art, the output from the transceiver is via cable **180**, which may terminate at an RJ11 connector, having Ring, Tip, and Common conductors.

Reference is now made to FIG. **4** which illustrates (generically) a system constructed in accordance with the present invention. The drawing more specifically illustrates an open-ended transceiver **270** constructed in accordance with the present invention. In this regard, the transceiver **270** includes a receiver circuit **250** that is configured to receive an electromagnetic signal (e.g., RF, optical, etc.) As described above, this signal includes an instruction code, and possibly other items such as a phone number, a transmitter identification code, etc. A data formatter **252** is provided in connection with a controller **256** to further format a signal that is to be output from the transceiver **270** to the central station **262**. In this regard, additional information may be added to the signal that is transmitted to the central station **262**.

For example, a transceiver identification code may be added to the signal. Although the central station **262** may decode the transmitter identification code (if provided) to identify, for example, a geographic location of a transmitter, in environments where the transmitter is a mobile (e.g., handheld), a transmitter identification code may be of no use in identifying a geographic location. In such an environment, the addition of a transceiver code will facilitate the identification of the transmitter location (recognizing that the transmitter will be located in the proximity of the transceiver **270**).

The controller **256** preferably performs the overall control and synchronization of functional operations within the transceiver **270**. In this regard, the controller **256** may be a general purpose microprocessor or microcontroller. If so, memory **257** will be provided to store programmable code for controlling the operation of the controller **256**. Circuitry may also be provided for network interface. For example, telephone circuitry **258** may also be provided for interfacing to the telephone circuitry **263** within the telephone **110**. The telephone **110** typically has circuitry configured to interface with the local loop of the PSTN **260**. The interface **258** within the transceiver **270** is designed to interface with this typical/standard telephone circuitry **263**. The specific implementation of the circuitry of block **258** will be appreciated by persons skilled in the art and need not be described in detail herein.

A look-up table **266** is also illustrated in FIG. **4**. It is illustrated in dashed line to represent that it may be optionally provided within the transceiver **270**. Consistent with the broader concepts of the invention, in certain embodiments, it may be desired to provide a more application specific transceiver **270**. In such embodiments, a look-up table **266** may be provided within the transceiver for decoding information such as the instruction code, the transmitter identification code, or any other information that may be transmitted from the transmitter. The specific use of such data will necessarily be application specific and controlled by the controller **256**, and need not be described herein.

At the central station **262**, a computer **290** may be provided to receive and process data received from the transceiver **270**. In this regard a database **292**, including a look-up table **294**, may be provided. Since the present invention is directed to the transceiver **270**, a variety of platforms may actually be implemented at the central station **262**. It will be appreciated, however, that with a computer **290** implementation, an extremely flexible and robust operation may be achieved. For example, the response of the central station **262** to various incoming messages may be programmed to vary depending upon the contents of the message.

By way of illustration, suppose in incoming message identifies a particular vending machine that is out of a given product. The computer **290**, upon recognizing this condition, may alert the appropriate person that is to restock the machine. To this end, the computer may so notify the person by sending the person an email message. Similarly, suppose the computer recognizes the incoming message as identifying that a particular vending machine is out of order, then the computer **290** may alert a different person that the machine is in need of technical service. In order to identify the contents of the various incoming messages, the central station **262** may employ a look-up table, like that illustrated in FIG. **5**

Referring to FIG. **5**, a look-up table is illustrated. Although the look-up table **294** may take on a wide variety of forms, the table illustrated in FIG. **5** includes two columns of data. The first column is a listing of the various instruction codes that are transmitted by the transmitter to the transceiver, and forwarded by the transceiver to the central station. The second column contains the specific functions or instructions that correspond to the transmitted/received instruction code.

Thus, by looking up the instruction code within the table **294**, the computer **290** at the central station can readily identify the function or instruction that is to be executed. For example, one code may indicate that a particular vending machine "n" is low on a specific product "X". Another code may indicate that a person "Y" is in distress. Yet another code may indicate that an industrial trash compactor "m" is in need of service

Thus, in one embodiment, the instruction codes themselves may be encoded to uniquely identify particular machines or persons. More particularly, in the illustrated embodiment, instruction code 00000001 identifies that vending machine "n" is low on product "X". In yet another embodiment, this same code may indicate that a vending machine (generally) is low on a product (generally) Additional codes may be generated at the transmitter and decoded at the central station to provide this more specific information For example, a transmitter identification code may be decoded by the central station to identify the specific vending machine that is low on product Likewise, an additional code, such as a product code, may be generated by the transmitter to identify the specific product that is low. Thus, in such an alternative embodiment, as many as three different look-up tables may be utilized at the central station **292**.

Having described the transceiver of the present invention, and illustrated its use in differing embodiments, reference is now made to FIG. **6**, which is a flowchart that depicts top-level functional operation of a transceiver constructed in accordance with one embodiment of the invention. In this regard, the transceiver awaits the receipt of a signal transmitted from a transmitter (**302**). Upon receipt of a transmitted signal, the transceiver (through the controller and data formatter) looks to identify and/or isolate the instruction code (**304**). The transceiver also looks, if appropriate, to identify a phone number of a central station (**306**). The transceiver then dials this central station, establishing a connection over the PSTN (**308**).

In this regard, the transceiver may be configured to seize the phone line. Thus, anyone making a call or any call currently in progress would be disconnected. Alternatively, the transceiver (through the controller) may be configured to test the phone line for its present availability. If a call is in progress, the controller may store the message received from the transmitter and await the availability of the phone line. Once the phone line becomes available, then the transceiver may assume the line and place its call. In yet a further embodiment, the transceiver may be configured to implement simultaneous voice/data technology to place the phone call to the central station without interrupting any ongoing call. In an even more complex embodiment, a different service may be provided in connection with the telephone **110** through which to place the call. For example, the telephone **110** may also be equipped with an ISDN service or a DSL service, through which the transmitted is communicated. As is known, communication through such a service may be made without any interruption to a call ongoing in the POTS frequency band.

Finally, the transceiver transmits the message, including the instruction code, and, if relevant, the transmitter identification code, the destination phone number, the transceiver identification code, etc. (**310**).

Referring now to FIG. **7**, a flowchart is shown that illustrates top-level functional operation of a system, in accordance with one aspect of the invention. In this regard, the system remains in an idle state, until the transmitter becomes activated (**320**). This activation may result from a user depressing a manual button on a transmitter or by an event triggering an input to a transmitter. Upon activation, the transmitter transmits a signal, including at least an instruction code (**322**). Thereafter the transceiver operates in accordance with the flowchart of FIG. **6**. The central station may then decode information received via the PSTN (specifically decoding the instruction code)

Based upon the decoded instruction code (and perhaps other codes in some embodiments), the central station initiates an appropriate action in response. For example, in response to a distress call, the central station may dispatch emergency personnel (**330**) In response to a service request, the central station may dispatch service personnel **332**. In response to other types of messages or requests, the central station may dispatch other personnel or take other appropriate action (**334**).

Having described the top-level functional operation of the invention, reference is made to FIG. **8**, which is a flowchart that depicts the operation of the system from more of a hardware level, as opposed to a functional level. The flowchart of FIG. **8** will not be described herein in detail, as a person of ordinary skill in the art will appreciate the system operation simply from a review of the flowchart and the nomenclature provided therein. For example, block **342** indicates the activation of the modem within the transceiver to dial-out onto the PSTN. The decision block **345** evaluates whether an appropriate connection has been established. If so the system proceeds to block **347** to transfer data. Alternatively, the system returns to block **343** and **344** to attempt a redial.

It should be appreciated that the foregoing description has been presented for purposes of illustration and description. Various alternative embodiments may be implemented completely consistent with the concepts and teachings of the invention. Indeed, the encoded message transmitter **148** is, preferably, different that that described above. In this regard, the message preferably transmitted is, in its most basic form, a fourteen byte message, defined by Table 1.

TABLE 1

Byte	Description
1-4	"To" Address - Four Hex Bites
5-8	"From" Address - Four Hex Bytes
9	Message Number
10-11	Packet Number
12	Byte Count (14-255)
13	Command (instruction code)
14	Data
15	Check Sum - Hex (modulo 8)

Thus, in a preferred embodiment, the message may transmitted to define a destination of the central station by the "To" address, which is a logical IP address. Thus, the transceiver may be configured to establish a connection with a predetermined remote number, which may this allow message routing in accordance with the IP protocol, using the Internet In this regard, bytes **1-4** of the message define the destination to which the message is routed.

When the central station receives the message, it may evaluate the "From" address, which will be unique to a given transmitter. This address, in turn defines the physical (e.g., geographic) location of the transmitter. That is, in many embodiments, knowing that a given transmitter was installed in a given device allows the central station **262** to known the location of the transmitter **148**.

Byte **13** defines the command or instruction code that is relayed to the central station In accordance with the general purpose nature of the system, a second byte (actually variable in size), permits the passage of data if necessary. For example, byte **13** may be encoded to indicate that a given product in a

vending machine is low on stock. Further detail, such as a description of the product, may be passed in byte **14**. In an alternative embodiment, this byte may be used to communicate other data. For example, in an embodiment where the transmitter is a hand-held transmitter, a panic button may be provided. The instruction code may be encoded to convey "help" or distress command (See, for example, U.S. Pat. No. 5,714,931, assigned to the assignee of the present invention, and is hereby incorporated by reference). The data field of byte **14** may be encoded to include personal data about the person carrying the transmitter In a banking environment, the instruction code may be one that requests access to an account, while the data field may convey the track one data, typically carried on the magnetic strip of a magnetic card.

In yet another embodiment, a transmitter may be provided on an automobile. Sensors may be disposed in numerous locations throughout the car. In this regard an automobile manufacturer may include a variety of diagnostic sensors covering a variety of the mechanical and electrical systems on the automobile If a system malfunctions, causing the car to break down, the transmitter may encode the relevant data into the data field of the transmitted message In this regard, the instruction code may be that the car is broken down and the data may be the data relevant to diagnose the reason for the breakdown Using this diagnostic information, a service person may be dispatched to the site of the vehicle with the necessary component(s) to service the vehicle, rather than simply dispatching a tow-truck to tow the vehicle to a service location (depending of course on the nature of the service required).

In embodiments such as a personal transmitter, an automotive transmitter, and other embodiments where the nature of the transmitter is necessarily mobile, the transmitter may also include global positioning system (GPS) circuitry. Thus, when the message is transmitted, the data field may also include the relevant GPS location, so that the geographic location of the transmitter may be readily identified and located.

In this regard, byte **14** is actually variable in length. It may vary from 0 to 241 bytes in length. To this end, byte **12** (byte count) will specify the size of the message, which in turn defines the number of bytes in the data field of the message. In the unlikely event that even more information is desired to be transmitted, the protocol defined in Table 1 allows for ready expandability In this regard bytes **9-11** define a message number and a packet number. Up to 255 messages can be sent in a burst transmission, and up to 65,536 packets may be strung together. In this way, the central station, upon receiving multiple burst transmissions may use the message number and packet number to reconstruct a relatively lengthy message transmission that is broken up over an number of successive transmissions.

Although it is preferred to implement the present invention through an open-ended transmission protocol, as defined above, it will be appreciated that the concepts and teachings of the present invention are not so limited. In fact, for purposes of the present invention, the message transmitted by the transmitter may be as simple as an instruction code that defines some condition, that a central station may decode and act upon. In such an embodiment, the transceiver may be specially configured to establish a phone connection with a predetermined central station.

In yet another embodiment, the transmitter may encode a message that transmits both an instruction code and a phone number that the transceiver is to establish a connection with. Such an embodiment, allows a generic transceiver to be utilized, such that multiple enterprises may utilize this common, generic transceiver for various applications Consistent with these broad concepts, a variety of other configurations may be employed as well.

Indeed, the foregoing description has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obvious modifications or variations are possible in light of the above teachings. For example, the transceiver has been illustrated herein having a transmitter configured to communicate across the PSTN. However, it will be appreciated that the transmitter may, consistent with the concepts and teachings of the present invention, be similarly configured to communicate via cellular technology as well. For example, in embodiments such as the automobile embodiment described above, it may be desirable to use a cellular transmitter, instead of a low-power RF transmitter This may be desired because the automobile may break down a relatively significant distance from the nearest pay-type telephone (e.g., location of the nearest transceiver). Thus, a transmitter in the automobile may establish a cellular communication link to a predetermined telephone number and convey the information in a similar message structure.

The embodiments of the present invention are not limited to the particular formulations, process steps, and materials disclosed herein as such formulations, process steps, and materials may vary somewhat. Moreover, the terminology employed herein is used for the purpose of describing exemplary embodiments only and the terminology is not intended to be limiting since the scope of the various embodiments of the present invention will be limited only by the appended claims and equivalents thereof.

Therefore, while embodiments of the invention are described with reference to exemplary embodiments, those skilled in the art will understand that variations and modifications can be effected within the scope of the invention as defined in the appended claims. Accordingly, the scope of the various embodiments of the present invention should not be limited to the above discussed embodiments, and should only be defined by the following claims and all equivalents.

I claim:

1. A device for communicating information, the device comprising:

a low-power transceiver module that is configured to wirelessly transmit a signal comprising an instruction data frame for delivery to a network of addressable low power transceivers wherein at least one low power transceiver has a communication link with a central location;

an interface circuit configured to establish a communication link with the central location based on an address included in the signal, the communication link comprising one or more low-power transceivers; and

a controller configured to receive one or more low power RF signals and communicate information contained within the signals to a central location along with a unique transceiver identification number over the communication link.

2. The device of claim **1**, the low power signal comprising a logical IP address such that the transceiver can route the information to a destination based on the logical IP address.

3. The device of claim **1**, wherein at least one of the controller and transceiver is further configured to communicate a transceiver identification code to the central location.

4. The device of claim 1, wherein transmitted and received signals further comprise a message identification field; a packet identification field; a network field, and a data field.

5. The device of claim 1, wherein transmitted and received signals further comprise a field configured to indicate a destination device for a subsequent transmission path to follow.

6. The device of claim 1, wherein the controller is configured on an integrated circuit and further configured to decode the instruction code and implement an associated instruction that corresponds to at least one of a product code or user account or application information.

7. A wireless communication method for relaying electronic messages in a wireless communication network comprising a plurality of wireless communication devices, the method comprising:

wirelessly receiving an information signal at a first wireless communication device, the information signal comprising a unique message code and an instruction code;

decoding the information signal to access the unique message code and the instruction code;

initiating communication with a second wireless communication device in the wireless communication network in response to the unique message code and the instruction code; and

communicating the unique message code from the first wireless communication device to the second communication device.

8. The method of claim 7, further comprises communicating a transceiver identification code from the first wireless communication device to the second wireless communication device in addition to a transmitter identification code that corresponds to a low-power transmitter.

9. The method of claim 8 further comprising decoding the transceiver identification code.

10. The method of claim 8, further comprising evaluating the transceiver identification code; and determining a geographical location of the first wireless communication device.

11. The method of claim 8, further comprising checking a received wireless signal for errors.

12. In a wireless communication system comprising at least one wireless communication device capable of communicating to at least one other communication device in a wireless communication network comprising a plurality of wireless communication devices, the at least one wireless communication device comprising:

a wireless receiver configured to wirelessly receive a low-power wireless signal, the low-power wireless signal being wirelessly transmitted in close proximity to the wireless receiver, the low-power signal comprising at least an encoded instruction code and a service code;

a wireless transmitter configured to transmit a wireless signal via the wireless communication network to another wireless communication device in the wireless communication network;

a controller connected to the wireless receiver and the wireless transmitter, the controller configured to obtain information encoded in a received low-power wireless signal and configured to deliver obtained information to the transmitter such that the transmitter can transmit the instruction code and the service code via the wireless communication network to at least one other wireless communication device in the wireless communication network.

13. In the wireless communication system of claim 12, wherein the controller is configured as a programmable integrated circuit.

14. In the wireless communication system of claim 13, wherein the controller comprises a look-up table configured to decode the encoded information.

15. In the wireless communication system of claim 14, wherein the low power wireless signal is at least one of a low power RF signal, a low power IR signal, or a low power ultrasound signal.

16. In the wireless communication system of claim 15, wherein the controller is further configured to take action in response to the decoded instruction code and the decoded service code.

17. In the wireless communication system of claim 16, further comprising a second wireless communication device in the plurality of wireless communication devices, the second wireless communication device in communication with the at least one wireless communication device and the second wireless communication device being configured to implement at least one of a received instruction code and service code.

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